

LARCHMONT HARBOR, NEW YORK.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING

Reports upon the survey and preliminary examination of Larchmont Harbor, New York.

DECEMBER 11, 1889.—Referred to the Committee on Rivers and Harbors and ordered to be printed.

WAR DEPARTMENT,
Washington City, December 5, 1889.

The Secretary of War has the honor to transmit to the House of Representatives, in compliance with the requirements of the river and harbor act of August 11, 1888, a copy of the report of Col. D. C. Houston, Corps of Engineers, upon the survey of Larchmont Harbor, New York, together with a copy of his report upon the preliminary examination of the same.

REDFIELD PROCTOR,
Secretary of War.

THE SPEAKER OF THE HOUSE OF REPRESENTATIVES.

OFFICE OF THE CHIEF OF ENGINEERS,
UNITED STATES ARMY,
Washington, D. C., December 4, 1889.

SIR: I have the honor to submit the inclosed copy of the report upon the survey of Larchmont Harbor, New York, dated November 26, 1889, made under the direction of Col. D. C. Houston, Corps of Engineers, to comply with the requirements of the river and harbor act of August 11, 1888, and accompanying map.

A copy of the report upon the preliminary examination of the harbor dated November 28, 1888, is also herewith.

The project for improvement contemplates the removal to the plane of 15 feet below mean low water of portions of Umbrella Rock and Huron Rock, which obstruct the entrance to the harbor. The amount of mate-

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rial to be removed is given at 3,665 cubic yards, at an estimated cost of \$126,600.

Very respectfully, your obedient servant,

THOS. LINCOLN CASEY,

Brig. Gen., Chief of Engineers.

Hon. REDFIELD PROCTOR,

Secretary of War.

PRELIMINARY EXAMINATION OF LARCHMONT HARBOR, NEW YORK.

ENGINEER OFFICE, UNITED STATES ARMY,

New York, November 28, 1888.

SIR: I have the honor to submit the following report on a preliminary examination of Larchmont Harbor, New York, made in pursuance of the river and harbor act of August 11, 1888, and directed in letter from the Chief of Engineers, dated August 28, 1888.

The accompanying report of Lieut. James C. Sanford, Corps of Engineers, gives a detailed description of the harbor and other information.

This harbor is located on the north shore of Long Island Sound, about 20 miles from New York City. At the entrance to the harbor are two rocks which are dangerous to navigation. The cost of removing these rocks to a depth of 15 feet at mean low water, is estimated approximately as follows:

Removal of Umbrella Rock, 2,500 cubic yards, at \$25	\$62,500
Removal of Huron Rock, 225 cubic yards, at \$25	5,625
Contingencies	9,875
Total	78,000

This harbor is principally used by vessels belonging to the Larchmont Yacht Club, one of the largest organizations of the kind in this country. In May, 1888, the yachts enrolled on the club's list included 25 steamers with a total tonnage of 1,754 tons, the largest measuring 568 tons; 26 schooners with a total tonnage of 1,491 tons; 70 sloops with a total tonnage of 1,672 tons, and 55 smaller boats.

Since then, from twenty to twenty-five new vessels have been added, ranging from 20 to 300 tons, making the total number about two hundred. The total value of these vessels is estimated at from \$3,500,000 to \$4,000,000. The harbor is also largely used by vessels belonging to other clubs, and to a small extent by commercial vessels.

In view of the value of the property to be benefited and the importance to the country of the yachting industry, I am of opinion that the harbor is worthy of improvement.

In the construction and navigation of yachts, a large number of persons are employed, improvements in ship-building are encouraged, seamen are trained in their duties and the naval power of the country is thus increased.

No general survey of the harbor is needed, as the Coast Survey charts are very complete, but a detailed survey of the rocks is necessary to ascertain the exact amount of material to be removed. For such a survey the sum of \$600 is estimated.

Very respectfully, your obedient servant,

D. C. HOUSTON,

Lieut. Col. of Engineers.

The CHIEF OF ENGINEERS, U. S. A.

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REPORT OF LIEUTENANT JAMES C. SANFORD, CORPS OF ENGINEERS.

ENGINEER OFFICE, UNITED STATES ARMY,
New York, October 19, 1888.

SIR: In accordance with your instructions I made a preliminary examination of Larchmont Harbor, New York, on the 19th ultimo, and have the honor to make the following report:

DESCRIPTION OF HARBOR.

Larchmont Harbor, known on the Coast Survey charts of Long Island Sound as Delancey Cove, is a bay indenting the north shore of Long Island Sound about 6 miles west of the boundary line between the States of New York and Connecticut. It is nearly rectangular in shape, and is about five-eighths of a mile long (north and south) by a half mile wide (east and west). The headland on the west side of the entrance projects about one-fourth of a mile further to the south than that on the east side (Long Beach Point). The depth varies from 0 to 18 feet at mean low water, though the latter depth exists only at the mouth of the harbor. The area within the 12-foot curve is about 13 acres, and that within the 6-foot curve about 68 acres. The mouth of the harbor is obstructed by two rocks: Umbrella Rock, with a depth of 4 feet over it at mean low water and an area within the 15-foot curve of about 1,350 square yards; and Huron Rock (not shown on the chart), with 9 feet depth at mean low water and an area within the 15-foot curve of about 225 square yards. Umbrella Rock is about 800 feet from the west side of the entrance, and Huron Rock about the same distance from the east side, both rocks being near the line joining the headlands. An extensive reef, with outlying shoal spots known as the Hen and Chickens, with its highest point 3 feet above mean low water and having an area within the 16-foot curve of about 75 acres, lies about 1,200 feet directly south of the mouth of the harbor, and prevents vessels from entering the harbor by a direct course. Umbrella Rock lies almost in the center of the channel by which vessels passing to the west of the Hen and Chickens enter the harbor, while Huron Rock occupies a similar position in the east channel. Several vessels have struck Umbrella Rock during the past season, one being considerably injured, and one vessel ran on Huron Rock (the existence of the rock was not known until this time) and could not be gotten off until the next high tide, sustaining severe injuries. On account of the danger of swinging against them, these rocks considerably reduce the anchorage room near the mouth of the harbor, where steamers and schooners of deep draught have to anchor. The harbor is often overcrowded, and the matter of anchorage room is an important one.

PRESENT COMMERCE.

Larchmont is a suburban village, having a population of about 2,000 in summer and 300 in winter, and is growing rapidly. It was founded and developed by a land association known as the Larchmont Manor Company. No business, except hotel keeping, is allowed to be carried on in the place, and the harbor is little used for commerce. The only cargoes brought into the harbor during the past year were, as far as I could learn, 4 schooner loads of building materials. It is, however, largely used by the vessels belonging to the Larchmont Yacht Club, one of the largest and most rapidly growing organizations of this kind in the country. In May, 1888, the club had a membership of 504, and the yachts enrolled on the club's list included 25 steamers, total tonnage 1,754 tons; 26 schooners, total tonnage 1,491 tons; 70 sloops, total tonnage 1,672 tons; and 55 smaller boats, tonnage not given, making a total of 176 vessels, with a total tonnage of 4,917 tons, exclusive of the 55 smaller boats. The club list issued in May, 1888, shows the condition of the club at that time. Since then the membership has been increased to 597, and from 20 to 25 new vessels, ranging from 20 to 300 tons, and having a larger average tonnage than the vessels on the May list, have been added. The total value of the vessels belonging to the club is estimated, from the known values of several of the vessels, at from \$3,500,000 to \$4,000,000.

A large number of the residents of Larchmont are members of the club and yacht owners. Their yachts are usually anchored in the harbor during the summer season (May 1 to October 15). The other yachts belonging to the club use the harbor for a considerable part of the season. In addition, a great many yachts belonging to other clubs use the harbor. Their number is estimated at about one-half the number belonging to the Larchmont Club. At the time of my visit, September 19, there were 4 steam-yachts, tonnage 260; 3 schooners, tonnage 142; 19 sloops, tonnage could not be obtained; 1 steam-launch, 2 naphtha-launches, and 6 cat-boats in the harbor, with a total value of \$465,000. On September 1 (the day of a regatta), I counted in the harbor 5 steam-yachts, tonnage 592; 9 schooners, tonnage 421; 42 sloops, tonnage of 3,125; 2 tugs, 1 of 100 tons; 4 steam-launches, 1 of 9 feet draught; 3 naphtha-launches and about 20 cat-boats. The number given above for September 19 is only about half that using the harbor daily in July and August. On the night of July 3, 1887,

124 cabin boats (exclusive of smaller) anchored in the harbor in readiness for the regatta of July 4; and on July 3, 1888, the number was considerably greater. At such times (6 to 10 days each season) the harbor is greatly overcrowded.

The yachts using the harbor frequently have to enter it after dark, on account of being becalmed, or other reasons. The rocks at the entrance are then very dangerous. The rather light construction of the yachts increases this danger, and their comparatively great value renders the wreck of one of the more valuable ones a serious loss.

It is said that within the past season from 100 to 200 commercial vessels have used the harbor for refuge from winds from west to northeast. This is a decided increase over previous years, and is due to the harbor being better known and its obstructions more thoroughly buoyed.

PROSPECTIVE COMMERCE.

The increase in the club's membership and in the number of yachts belonging to it has been very rapid. This increase will probably continue. The proportional increase in tonnage has been still greater, and it is expected that most of the largest yachts on the North Atlantic coast will soon be on the club's list. The finest yacht club-house in the country, it is said, has been erected here during the past year, at a cost of over \$100,000, and grounds covering several acres and having a large water front have been bought and finely improved by the club. These added attractions have largely increased the use of the harbor by yachts during the past season, and a continued increase may be looked for. A ship-yard and marine railway for the repair of yachts and other vessels is to be established on the west side of the harbor. It is thought that the harbor would be considerably used as a harbor of refuge by coasting vessels if the obstructions at its mouth were removed. The improvement of the harbor would increase its use by the large yachting fleet of Long Island Sound and New York Harbor, and would relieve the anchorage ground of commercial harbors, where the anchoring of yachts often seriously interferes with commerce. New Rochelle Harbor, City Island Roads, and parts of New York Bay are much obstructed in this way, and collisions often result from it.

DESIRED IMPROVEMENT.

The removal of Huron Rock to 15 feet at mean low water, and of Umbrella Rock preferably to 15 feet, though its removal to 12 feet would give substantial relief, as there were on the list of last May only six vessels belonging to the club drawing 12 feet or over, is desired.

To remove Huron Rock to 15 feet would require the removal approximately of 225 cubic yards of rock measured in place, which, at \$25 per cubic yard, would cost \$5,625.

To remove Umbrella Rock to 15 feet would require approximately the removal of 2,500 cubic yards of rock, which, at \$25 per cubic yard, would cost \$62,500.

Adding \$9,875 (about 15 per cent) for engineering and contingencies, would make a total of \$78,000.

If Umbrella Rock were removed to 12 feet the cost of its removal would be reduced about one-half, and the total cost of the improvement would be about \$42,500.

The rock taken out can be deposited in the upper part of the harbor, where it is desired to form a breakwater.

Before a close estimate could be made, a careful survey would be necessary. I should estimate its cost at \$600.

I am indebted to Messrs. G. C. W. Lowrey, E. L. Bushe, and others, of the Larchmont Yacht Club, for information and facilities for making the examination.

Very respectfully, your obedient servant,

JAMES C. SANFORD,
First Lieut. of Engineers.

Col. D. C. HOUSTON,
Corps of Engineers, U. S. A.

SURVEY OF LARCHMONT HARBOR, NEW YORK.

ENGINEER OFFICE, UNITED STATES ARMY,
New York, November 26, 1889.

GENERAL: I have the honor to submit the following report on survey of Larchmont Harbor, Long Island Sound, New York, made in pursuance of the river and harbor act of August 11, 1888.

I would refer to my preliminary report, dated November 28, 1888, for information as to the amount of commerce and navigation to be bene-

fited by the improvement of this harbor. The entrance to the harbor is obstructed by two rocks, shown on the accompanying tracing, known as Umbrella and Huron rocks. When the preliminary examination was made it was understood to be the desire of those interested in the harbor to have these rocks removed, and a detailed survey was made in August–September, 1889, by Mr. Henry N. Babcock, assistant engineer, for the purpose of making an accurate estimate. I transmit his report, which includes a survey of other obstructions and an alternate project for breakwaters. This latter does not at present meet the approval of those interested, but is submitted for consideration.

The quantity of rock to be removed above the plane of 15 feet below mean low water is—for Umbrella Rock, 3,329 cubic yards; for Huron Rock, 336 cubic yards; total, 3,665 cubic yards. The estimated cost of removing this amount, including contingent expenses, is \$126,600.

The rock removed should be deposited on the northerly end of Hen and Chickens Reef, in depth of 14 or 15 feet, to form a breakwater or beacon to clearly mark the location of the reef and the entrance to Larchmont Harbor.

Very respectfully, your obedient servant,

D. C. HOUSTON,
Colonel of Engineers.

The CHIEF OF ENGINEERS, U. S. A.

REPORT OF MR. HENRY N. BABCOCK, ASSISTANT ENGINEER.

ENGINEER OFFICE UNITED STATES ARMY,
New York, November 21, 1889.

COLONEL: I have the honor to submit the following report upon a survey of Larchmont Harbor, New York, made under your direction in August–September, 1889.

GENERAL DESCRIPTION OF HARBOR AND STATEMENT OF PRESENT AND PROSPECTIVE COMMERCE.

These are given in sufficient detail and accuracy in your report on the preliminary examination of Larchmont Harbor (with Lieutenant Sanford's report as inclosure) dated November 23, 1888 (see Letters Sent—examinations and surveys, pages 204–210). The name of the harbor is changed from Delancy Cove to Larchmont Harbor on the last Coast Survey chart. No material changes have taken place in present or prospective commerce since the date of that report.

SURVEY AND MAP.

In your report upon the preliminary examination you stated that no general survey of the harbor was needed, as the Coast Survey chart was very complete, but a detailed survey of the rocks was necessary to ascertain the exact amount of material to be removed. However, part of the time the water was too rough to work on the rocks, and during that time a partial survey of the harbor was made in order to show the relation of the rocks to the channels and anchorage ground.

Umbrella Rock was surveyed by driving four stakes around it and stretching lines across, taking soundings at 5-foot intervals. One of these stakes was run down by a schooner soon after setting, and was replaced. After the work of sounding was nearly finished sea-weed collected on the lines to such an extent that they could not be stretched tight, and the rest of the rock was covered with soundings located by transits on shore.

Huron Rock was also surveyed by angles taken to each sounding, as the bottom there was too hard to drive stakes.

Besides, there are two ledges inside the harbor which were surveyed, as verbally directed by you. Soundings on these ledges were also located by intersecting angles. I could not find any local name applied to these ledges, so have designated them on the map as North Ledge and South Ledge; each is marked by two spindles, one near the upper and one near the lower end.

Mean low-water plane was determined by leveling to connect the tide-gauge with the bench-mark at New Rochelle Harbor.

The general map of the harbor is platted to a scale of 200 feet to the inch, and detailed maps of the rocks on the same sheet to a scale of 20 feet to the inch.

DETAILED DESCRIPTION OF ROCKS.

Umbrella Rock is about 800 feet southeast from Umbrella Point, from which it is separated by a channel over 16 feet deep quite up to the shore, with bottom of soft mud. The rock is entirely surrounded by mud so soft that in places it is difficult to tell whether the sounding passes through mud or not before reaching the rock. Umbrella Rock has two summits, one with a least depth of 3.1 feet, the other with least depth of 3.9 feet, and having a gap about 10 feet deep between them. The surface of the rock is quite ragged. The least bottom depth around the rock is 15 feet.

Following are the areas of contours 3 feet apart on this rock and the volume of rock in place above such contours:

	Area of.	Volume above.
	<i>Square yards.</i>	<i>Cubic yards.</i>
6-foot contour	209	55
9-foot contour	800	550
12-foot contour	1,394	1,657
15-foot contour	1,997	3,329

Showing that the average depth of rock is above the 12-foot curve 3.6 feet, above the 15-foot curve 5.0 feet.

Huron Rock is about 900 feet southwest from Flagler's Point, to which it is connected by a gradually sloping bottom with maximum depth of 15 feet, the bottom being hard sand with many out-croppings of rock, probably boulders.

The channel between the rock and shore is safe only for light-draught vessels. Huron Rock is apparently a ledge, with least depth of 9.8 feet, while the least depth of the surrounding bottom is 15 feet.

Following are the areas of contours 3 feet apart, with the volumes of rock in place above each:

	Area of.	Volume above.
	<i>Square yards.</i>	<i>Cubic yards.</i>
9-foot contour	0	0
12-foot contour	148	42
15-foot contour	495	336

Showing that the average depth of rock is above the 12-foot curve 1.2 feet, above the 15-foot curve 2.0 feet.

North Ledge lies near the west side of the harbor, about 1,700 feet north of Umbrella Rock: it is separated from the west shore by a channel of 10 feet depth (except at the north end, where the depth is 9 feet), with muddy bottom, but this channel is very little used. The rock is continuous, but has three crests rising above low-water mark, with elevations +0.7, +0.10, +2.4, and depths of 4 feet or over between. The rock is quite ragged and irregular.

Following are the areas of certain contours and volume of rock in place above each:

	Area of.	Volume above.
	<i>Square yards.</i>	<i>Cubic yards.</i>
Mean low-water contour	74	22
6-foot contour	1,304	1,080
9-foot contour	2,602	3,024

Showing that the average depth of rock is above the 6-foot curve 2.5 feet; above the 9-foot curve 3.5 feet.

South Ledge also lies near the west side of and near the mouth of the harbor; between it and the west shore there is a channel of 11 feet depth, with soft mud bottom, but the channel is out of the way and but little used. The rock is in two parts separated by a channel 10 feet deep and about 25 feet wide. The north part rises to 4.1 feet above low water and the south part to 1.0 foot above.

Following are the areas of certain contours for both parts of this ledge together, with volumes of rock in place above those contours:

	Area of.	Volume above.
	<i>Square yards.</i>	<i>Cubic yards.</i>
Mean low-water contour.....	151	53
6-foot contour.....	791	859
9-foot contour.....	1,205	1,864
11-foot contour.....	1,553	2,773

Showing that the average depth of rock is above the 6-foot curve 3.2 feet; above the 9-foot curve 4.6 feet; above the 11-foot curve 5.3 feet.

DESIRED IMPROVEMENT.

At the time of the survey I spoke with several members of the Larchmont Yacht Club, who are the parties chiefly interested; what they wished was the removal of Umbrella and Huron rocks. They would also like to have the North Ledge removed, but did not think they would ask the United States to undertake that now. At some subsequent time they said that they meant to ask the Government to build a breakwater off Flagler's Point and perhaps another off the mouth of the harbor, to improve their anchorage-ground. I suggested to them that removing rocks was expensive work, and that if the breakwater could be arranged to cover the rocks, it would not be necessary to remove them. I made rough estimates from the Coast Survey charts of the probable cost of breakwaters from each side of the mouth of the harbor, one to extend to and cover Huron rock, the other to extend to and cover Umbrella Rock, and the general opinion seemed to be that, as the cost would not (apparently) exceed that of removing the rocks, it would be the better plan to adopt; and they wished an opportunity to consider it further when the map was platted and definite estimates could be made. The members of the club whom I spoke with were chiefly, Commodore Lowry, Vice-Commodore Allie, Treasurer Bushe, and Messrs. Coats and Murray of executive committee. From your recent letter from Commodore Lowry, I understand that the project for breakwaters is definitely abandoned, but, as directed by you, I submit herewith estimates both for removal of rocks and for breakwaters.

ESTIMATES OF COST.

On account of the exposed position of Umbrella and Huron rocks I do not think it would be safe to estimate the cost of their removal at less than \$30 per yard, with 15 per cent. allowed for contingencies; though if the work could all be done under one contract it might be accomplished for less. North and South ledges are more sheltered and would have to be excavated to less depth, and a fair price for them would be \$25 per yard. To remove Umbrella Rock to 12 feet, while the depth around it is 15 feet, would probably be unsatisfactory, and efforts would subsequently be made to have it taken out to 15 feet depth; it would be much more economical to take it out to 15 feet depth at first.

Umbrella Rock, removing to 12 feet depth, 1,657 cubic yards at \$30	\$49,710
Add about 15 per cent. for contingencies	7,290
Total	57,000
Umbrella Rock, removing to 15 feet depth, 3,329 cubic yards at \$30	99,870
Add about 15 per cent. for contingencies	15,130
Total	115,000
Huron Rock, removing to 15 feet depth, 336 cubic yards at \$30	10,080
Add about 15 per cent. for contingencies	1,520
Total	11,600
North Ledge, removing to 9 feet depth, 3,024 cubic yards at \$25	75,600
Add about 15 per cent. for contingencies	11,400
Total	87,000
South Ledge, removing to 11 feet depth, 2,773 cubic yards at \$25	69,325
Add about 15 per cent. for contingencies	10,375
Total	79,700

Omitting North and South ledges, whose removal is not asked for, the cost of removing Umbrella and Huron rocks to 15 feet depth would be \$115,000 + \$11,600 = \$126,600. Or of removing Huron to 15 feet and Umbrella to 12 feet, \$57,000 + \$11,600 = \$68,600.

BREAKWATERS.

Breakwaters in this position should be about 5 feet wide on top and built to 10 feet above low water (2½ feet above high water), with side slopes of one on one.

Such a breakwater to cover Huron Rock would be 930 feet long; the bottom is very hard and little or nothing need be allowed for settling. It would contain 23,000 tons of riprap.

Such a breakwater to cover Umbrella Rock would be 800 feet long; the bottom is quite soft, and 4 feet average should be allowed for settling. It would contain 42,000 tons of riprap.

Judging from prices obtained at David's Island sea-wall, riprap ought to be purchased for these breakwaters at \$1.10 per ton; the depth is ample for any vessels, except at the shore ends and on the top of Umbrella Rock, and there is a harbor close at hand. It is not probable, however, that such rates could be obtained, and for purposes of this estimate the cost is placed at \$1.40 per ton.

Cost of Huron Breakwater would be 23,000 tons of riprap at \$1.40.....	\$32,200
Add about 15 per cent. for contingencies.....	4,800

Total	37,000
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Cost of Umbrella Breakwater would be 42,000 tons of riprap at \$1.40.....	58,800
Add about 15 per cent. for contingencies.....	9,200

Total	68,000
or total cost for both breakwaters \$68,000 + \$37,000 = \$105,000.	

The clear opening between these breakwaters would be 930 feet, with depth of over 15 feet, or greater than obtains in the harbor above.

SUMMARY.

There are certain advantages which the plan for breakwaters would have over the one for removing the rocks, and which I take the liberty of suggesting; some of them you would notice at once, others depend more or less on the nature and use of this particular harbor, and are apparent only on the ground or upon consideration of the map.

(1) The channels east of Huron Rock and west of Umbrella Rock are seldom used; during six days that I was at Larchmont I saw many vessels enter and go out, and do not remember one to have used those channels. The channel between the rocks is nearly as direct in any case; it is over 900 feet wide, and would amply accommodate all vessels using the harbor.

(2) The harbor is not secure enough in case of easterly gales; for three days during the survey a strong northeast wind was blowing and vessels had to go well up the harbor into shoal water. The harbor is more exposed to east and southeast gales than to northeast. The fact that certain members of the yacht club had considered the need of a breakwater shows that the harbor is not always secure.

(3) I was told that at some seasons of the year quite a number of oyster and fishing boats run in there for the night or for shelter during storms; they would not be materially interested in having the rocks removed, but would be in having the safety of the harbor improved.

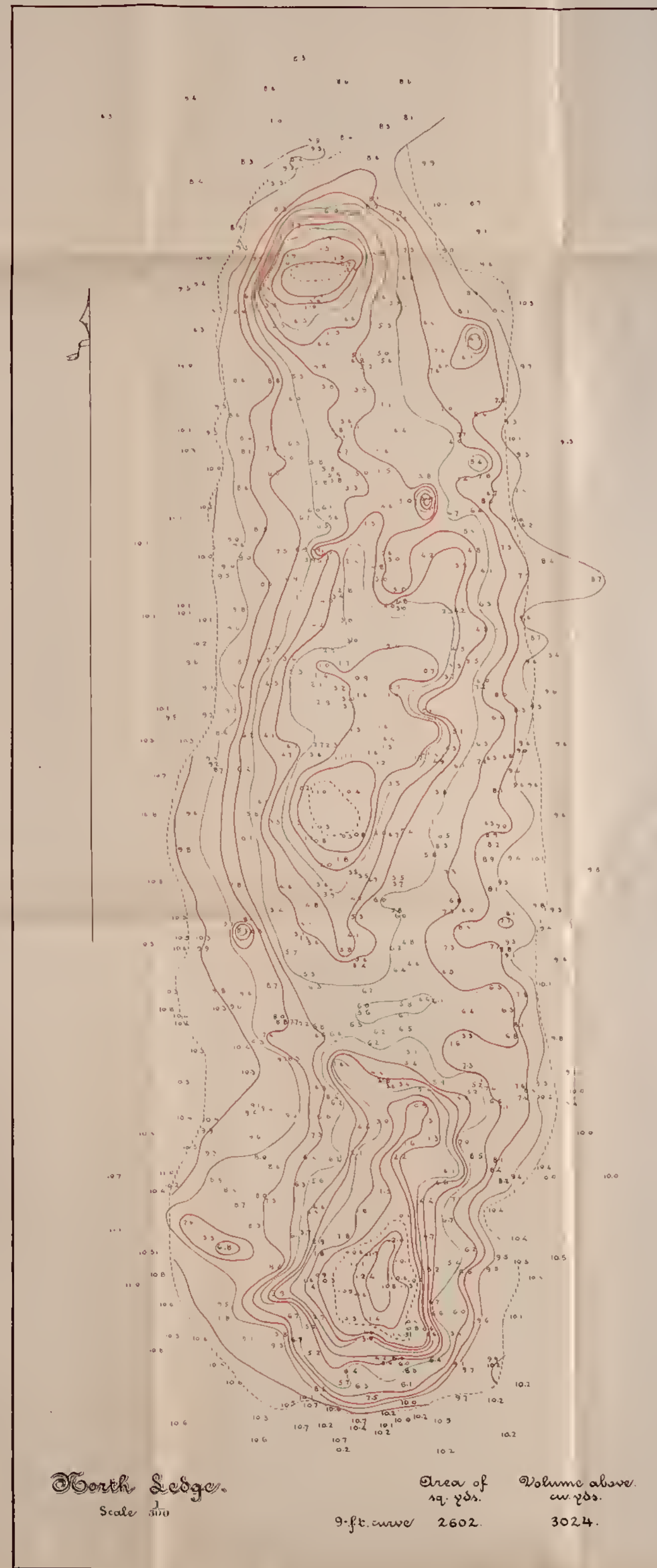
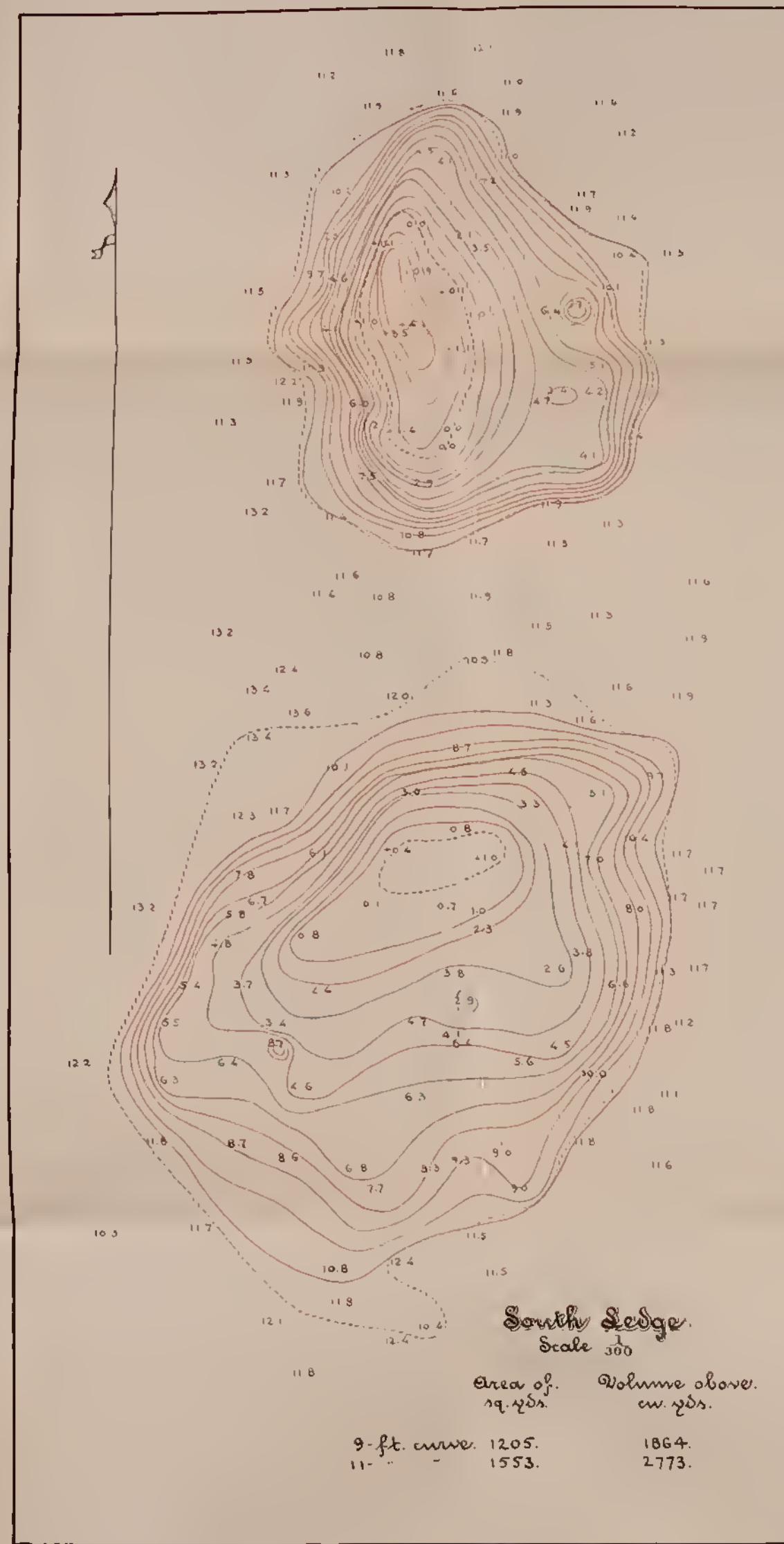
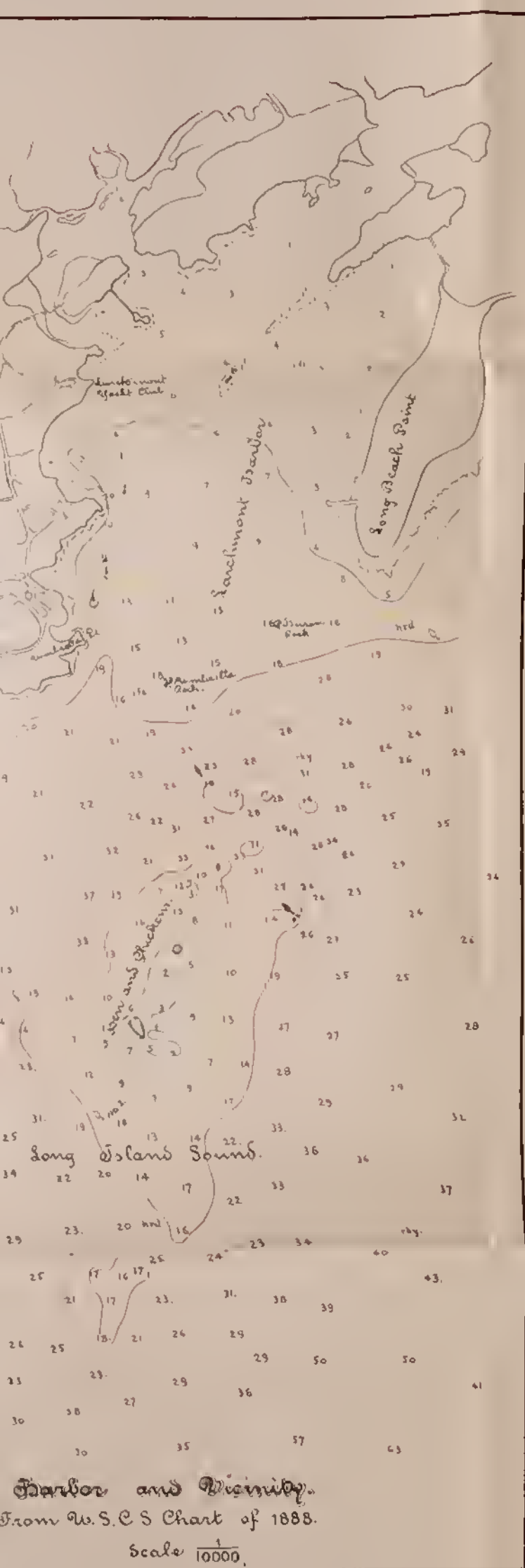
(4) These breakwaters would secure a shelter from storms of from 30 to 90 acres area, according to direction of storms.

(5) Besides the evident economy, as appears in the estimates, it is impossible to tell in advance what submarine rock removal will cost, if let by contract; if done under successive small appropriations the cost might be considerably above the estimate. A proper price for riprap can be much more readily ascertained, and if it were purchased at a favorable time, and excavation stone from New York City were accepted, the price might be much lower than the estimated cost per ton.

Respectfully submitted.

HENRY N. BABCOCK,
Assistant Engineer.

Col. D. C. HOUSTON,
Corps of Engineers.



1889. Sachinmont Harbor, N.Y.

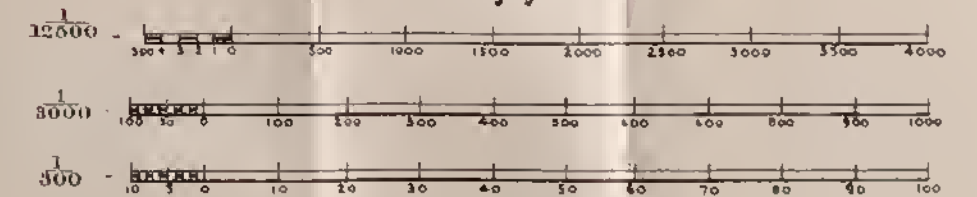
Vicinity of Harbor from U.S.C.S.,
Scale 12500

General Map of Harbor,
Scale 3000

Detailed Maps of four Rocks,
Scale 500

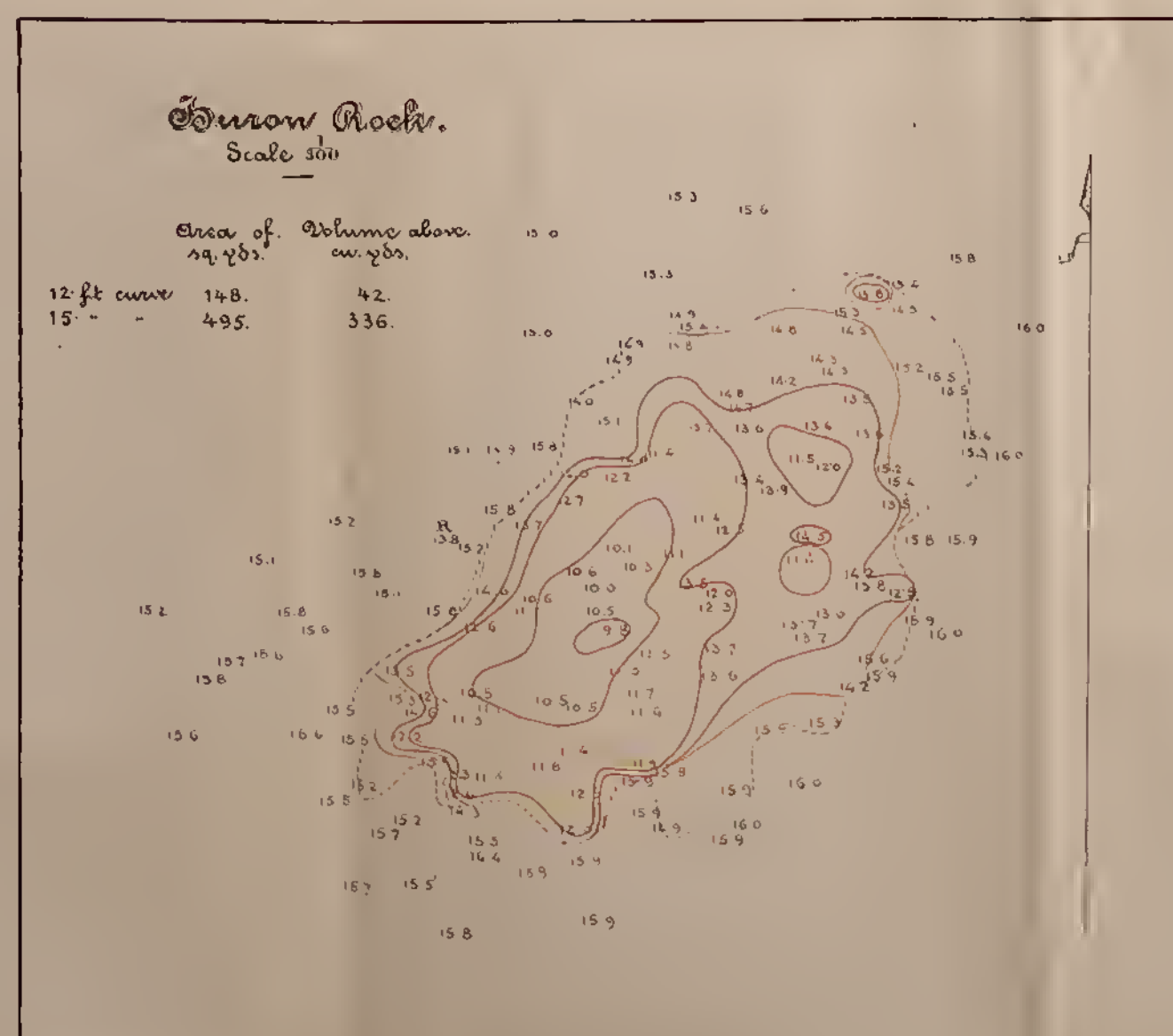
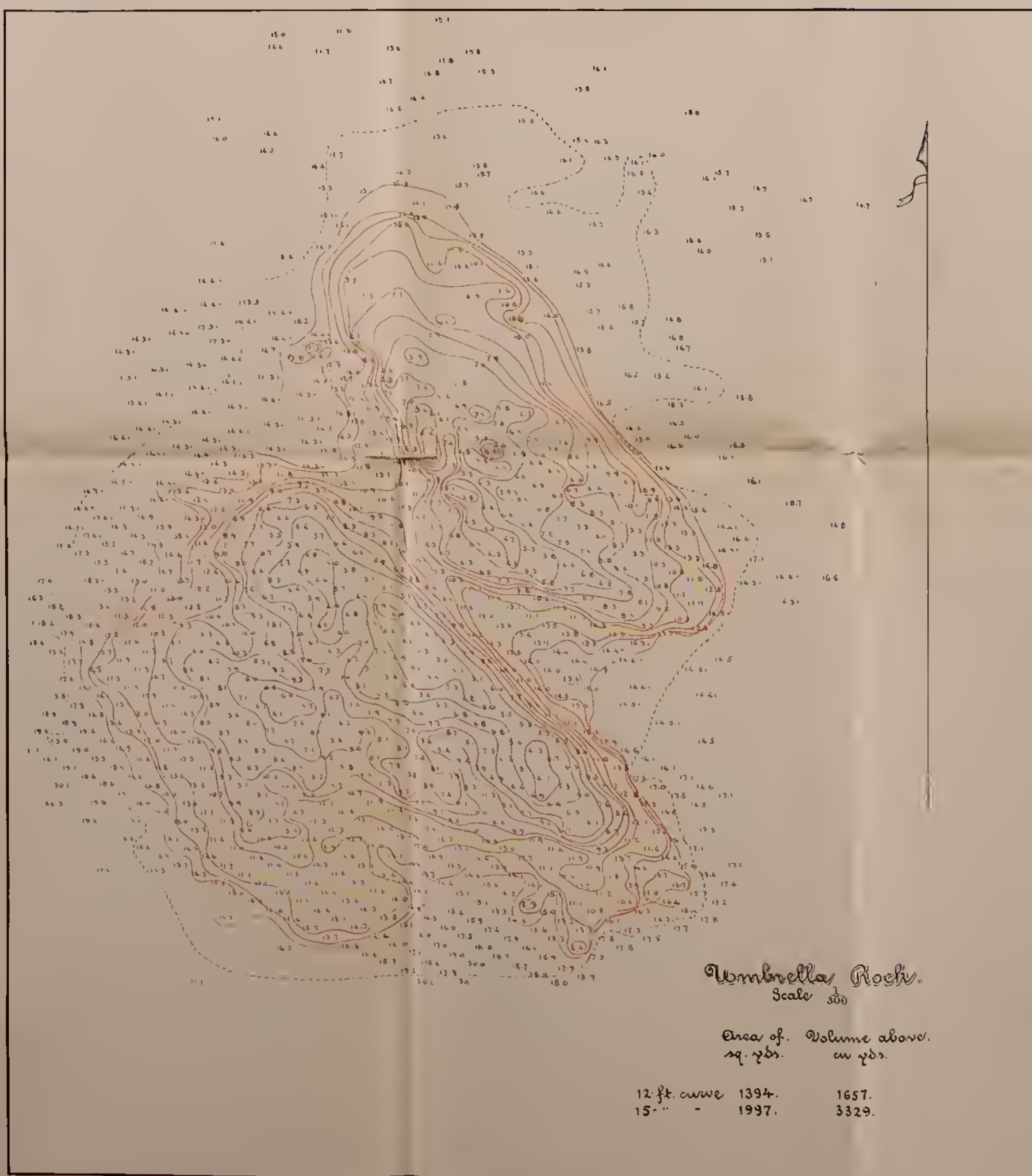
Survey made under direction
—of—
Col. D.C. Houston, Corps of Engineers, U.S.A.,
and in compliance with
Section 13 of River and Harbor Act of August 11,
—1888—

Scales of feet.



Soundings are in feet and tenths, and are referred to the plane of mean low water.

Ocean rise of tide 7.4 feet.
Contours are drawn as follows:—
Ocean low water, dotted black.
3 foot depth, blue.
6 " " green.
9 " " brown.
12 " " yellow.
15 " " orange.
and on the detailed maps of rocks, intermediate contours are drawn at every foot—in red.

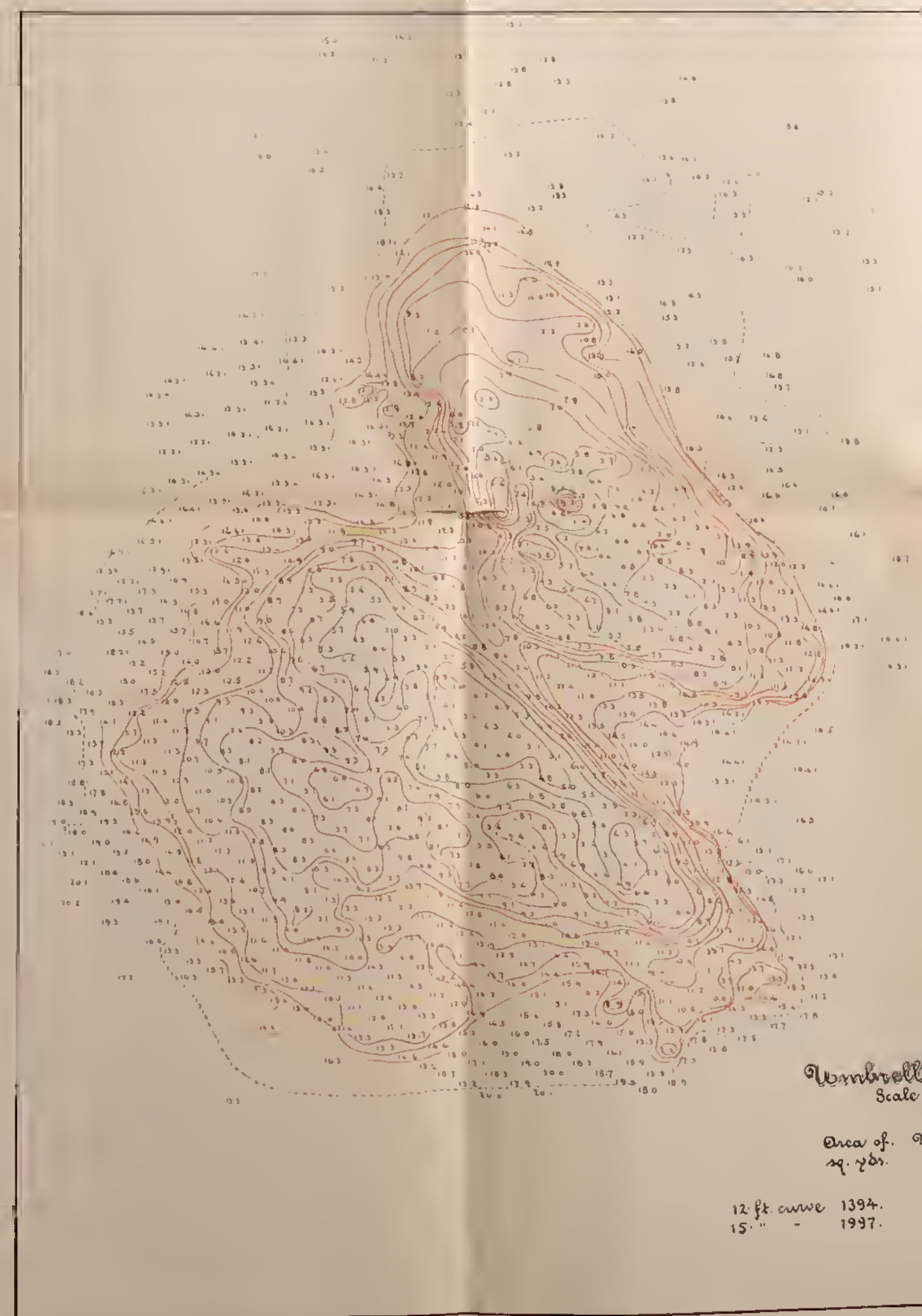
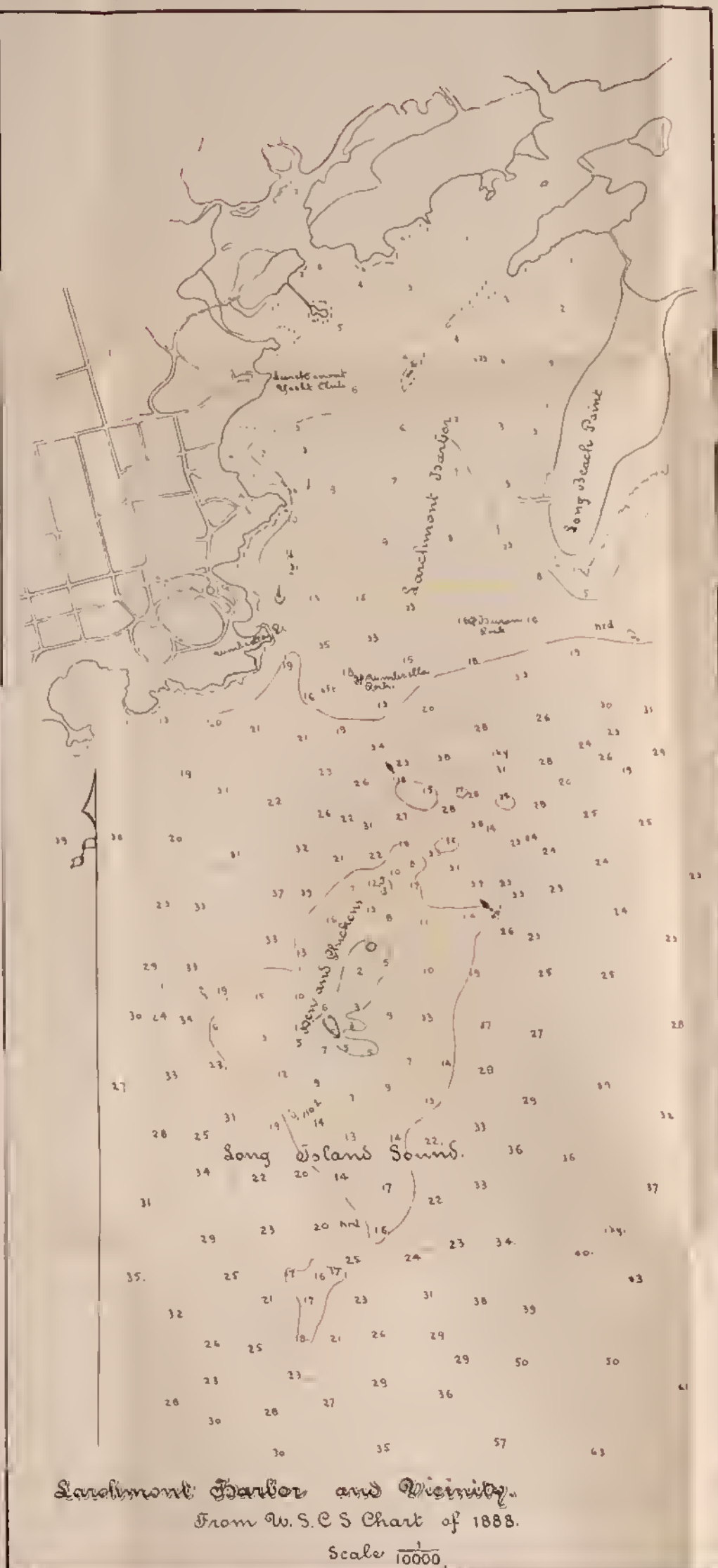


Engineer Office, U.S. Army,
New York City, Nov 26, 1889.
Sent to the Chief of Engineers with
letter of this date.
D.C. Houston
Colonel of Engineers.

Larchmont Harbor, N.Y.

Scale 10000

Hydrographic 1889



Umbrell
Scale

Area of
sq. yds.

12 ft curve 1394.
15 " 1937.



OYU11243 BOX 91